Honeywell

# P520 Signal Processor

**USER MANUAL**

## APPLICATION

The Honeywell P520 is a rack mounting signal processor that is compatible with viewing heads in the S5XX and S55XB/BE series. These include models S506, S509, S511 and S512, and the advanced viewing head series models S550B/BE, S552B/BE and S556B/BE. There is only one model of the P520 available, which is DC powered. A rear backplane PC Board is required for termination (order part number REARPCB separately for initial installation).

## FEATURES

- **Rack mounted system, designed to conform to the DIN 41494 19 inch card frame system**
- **3U high and 21HP wide, or 5.06 x 4.18 inches with a length of 8.66 inches (220mm)**
- **Once rack mounted, together with a power supply and appropriate viewing head makes up a complete flame monitoring system**

## SPECIFICATIONS

**Electrical Ratings**
Input Power: 22 - 26VDC, 130mA (plus 100mA for each Viewing Head.)
Battery Backup: 24VDC, 130mA (plus 100mA for each Viewing Head.) Main Voltage > Battery Voltage

**Ambient Temperature:**
0°C to 52°C (32°F to 125°F) CSA Rating
0°C to 60°C (32°F to 140°F) FM Rating

**Outputs:**
Flame Relay: 2 Form C Contacts (DPDT)
Self-Checking Relay: 1 Form C Contact (SPDT)
Contact Ratings: 5A at 30 VDC, 125 VAC and 277 VAC
Max switching voltage 220Vdc, 250Vac
Analog Flame Signal: 0 to 19.8mA current output for remote meters and 4 to 19.8mA output. (360 ohm max. resistance.)
Power to Viewing Head:
+26VDC maximum, fused 0.25A (self-resetting)
+14.3VDC pulsing 0.2 seconds ON, 0.8 seconds OFF

**Inputs:**
Channel Select (Isolated Input):
7.5-30VDC range
Input resistance 3900 ohms
26VDC maximum, 6.4mA
10VDC, 2.3mA
Flame Signal from Viewing Head (Isolated Input):
7.5-30VDC range
Input resistance 3900 ohms
13.6VDC, 3.2mA

**Serial Communications:**
RS-422 (Differential)
4800 or 9600 baud (user selected)
4 wire / 2 twisted pair

**Cable (between viewing head and signal processor):**
4 conductor, #16 AWG or #18 AWG, one wire shielded with braided shield for flame signal. Honeywell C328 cable is recommended.

66-2066-01

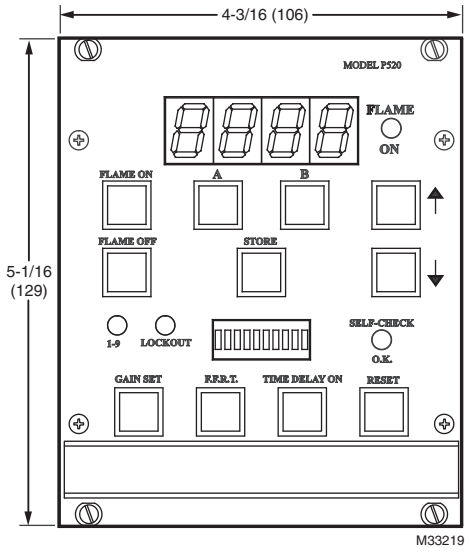



**Fig. 1. P520 front faceplate dimensions.**

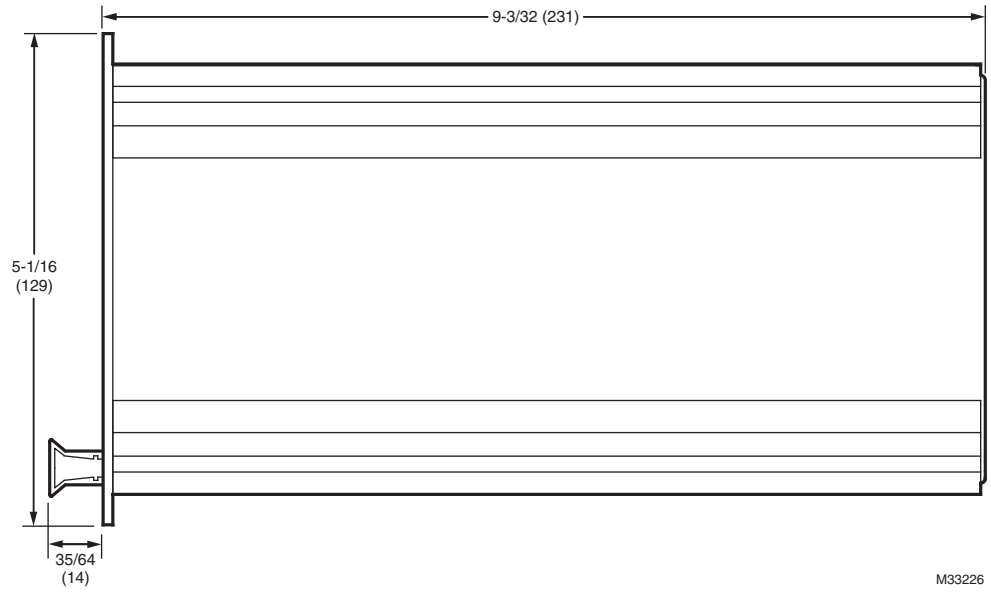



**Fig. 2. P520 side view dimensions.**

# INSTALLATION

## When Installing this Product…

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced, flame safeguard control technician.
4. After installation is complete, check out product operation as provided in these instructions.

## Grounding and Shielding

**NOTE: Installer must be a trained, experienced flame safeguard service technician and should be familiar with the equipment operation and limitations and be aware of any applicable local codes and regulations.**

1. Connect a safety ground to the viewing head housing (if applicable).
2. The viewing head and all associated cable/conduit must be at least 12 inches (31 cm) from any source of high energy or voltage (for example, igniter equipment).

3. Install a ground wire from the ignition transformer case to the igniter assembly.
4. Ensure all igniter wires and cables show no signs of wear. Replace any igniter cables or wires that are frayed or cracked.
5. The viewing head must be electrically isolated from the burner front.
   a. Electrical isolation can be accomplished by installing an Ultem nipple or an Ultem locking coupler adapter in conjunction with a locking coupler between the viewing head flange and the burner mount.
   b. The purge air line should also be isolated from the viewing head. This can be accomplished by installing any insulating material, for example a rubber hose, in between the purge air line and the viewing head.
6. On the terminals going to the viewing heads on the back of the P520, the terminals marked GND go to pin 5 of the S5XX and S55XB viewing head plug and to the designated ground pin for the S55XBE viewing head plug. Pin 5 of the S5XX and S55XB and the ground pin for the S55XBE viewing head male receptacles have an internal tab that grounds this connection to the viewing head housing. The terminal marked GND connects to the chassis ground of the P520. This ground is made through the internal PCB to the metal base of the P520.

It is important that good grounding practices be followed when connecting power supplies. Interference problems can occur if the power supply chassis and the P520 chassis are at a different ground potential than the viewing head housing, which will be at a ground potential associated with the burner front. In these situations, the Honeywell viewing head effectively supplies a plant ground between the burner front and the panel enclosure. If there is a large potential difference between these points, considerable current can flow through the viewing head cable, which can, in turn, damage the P520 signal processor or the associated power supply.

## Card Frames

Four card guides are required for each P520 module; therefore, a total of sixteen card guides would be required to mount four P520 modules. Card guides are available as off the shelf parts and are not available from Honeywell.

The resulting rack will require spacers for the top and bottom of the rear backplane PCB. Card guides are required as well for installation. Spacers and card guides are available from electronic vendors and are not available from Honeywell.

A half-card frame, or “half rack” (9.5 inches wide) may be used as an alternative to the 19-inch card frame. A half rack will mount two P520 modules.

## Wiring the Rear PC Board

A diagram of the rear backplane circuit board is shown in Fig. 1. The relay outputs are located on the nine-contact terminal block located on the upper right of the board

RC C refers to the common terminal of the self-checking relay. There is only one pair of contacts used for the self-checking function. Here, the designation ON refers to the self-checking taking place in a normal manner. OFF indicates a failure in the viewing head or processor resulting from

- the internal or external hardware
- electronic critical component failure
- the power to the unit is OFF – the most likely condition

The horizontal set of six terminals (top left) is used for the main power into this plug-in module (PWR IN). Each designated terminal is a double terminal, or pair, so that the wiring from the power supply can be “daisy chained” from one P520 to the next without having to twist wires together into one termination.

The pair designated BAT is for battery backup, if used. The backup battery, if used, should be 24 volts, to ensure that the 24VDC power feeding the P520 will not feed back into the battery. In other words, no current will flow from the battery as long as voltage of the main power supply is above that of the battery. The negative side of the battery goes to the GND terminal on the right.

Fig. 1 shows how these terminals are connected inside the P520. Note the two fuses marked F1 and F2. F1 is the main power fuse for the signal processor as well as the viewing head(s), and is rated at .75 Amp. Fuse F2 feeds only to the viewing head(s), and is rated at .25 Amp. Each viewing head draws about 100mA, so this output can supply up to two viewing heads. On all currently manufactured units, these fuses are self-resetting types, and will recover from an overload automatically after power is removed from the P520 for 10 seconds.

Just below the six-pin PWR IN terminals are two, five-pin vertically-mounted viewing head terminals identified as V.H. A. and V.H. B. If only one viewing head is used, you must wire to the V.H. A. terminals. Below the V.H. A. terminals are two terminals marked V.H. SEL (viewing head selector relay). Energizing this connection with 24VDC will cause the relay on this PCB to switch to viewing head B.

Only the viewing head signal wire (SIG) and the signal ground wire (SIG GND) are switched with this changeover relay; the 24VDC and power ground circuit is not disturbed. Make sure that the viewing head signal wire and signal ground (braided shield in the four-conductor cable) are both connected, because this ground connection is the only return path for the signal and self-checking circuit. The 24VDC used to switch this relay can be connected without regard to polarity. The two terminals marked V.H. SEL go directly to the relay coil.

The two-pin terminal to the right of V.H. SEL designated CHAN SEL is used for selecting channel A or channel B on the P520. Energizing this pair of terminals causes the B channel to be selected.

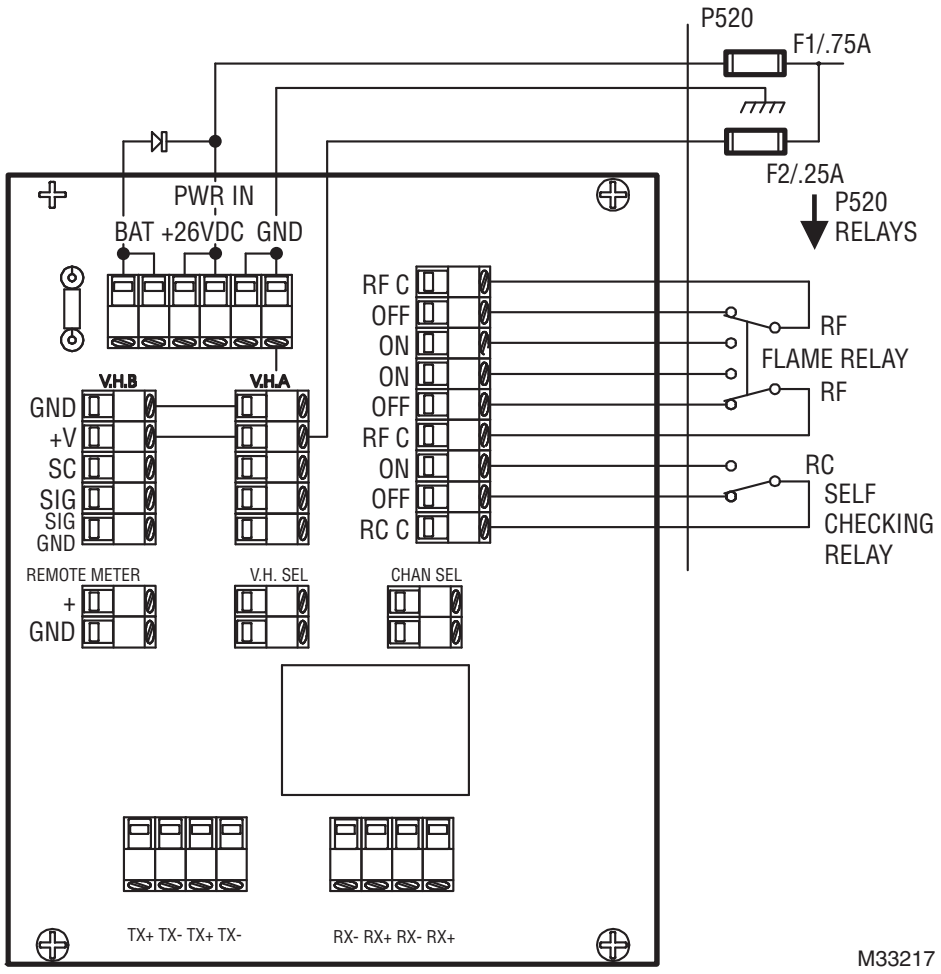



**Fig. 3. Rear PCB terminal wiring.**

Polarity must be observed when wiring this connection (the positive terminal is on the top). This is an isolated input, so two wires are required. Any DC voltage from 7.5 to 30 may be used. The current required will depend upon the voltage, because this is a photocoupler interface circuit with a 3900 ohm resistor feeding the LED light source.

For example: a 26VDC voltage will result in a current flow of 25/3900 =.0064 Amp.

If flame is being detected and the channels are switched, the flame relay will remain energized for one cycle regardless of the new set points, allowing channel changes “on the fly,” so to speak. If the new flame OFF set point is equal to or greater than the current signal count, then the flame relay will de-energize on the subsequent cycle.

The remaining two-pin terminal designated REMOTE METER (to the left of the V.H. SEL terminals) is for the remote meter connection. This output is a current-driven signal that ranges from 0 to 20mA for remote meters, and can be switched to a range of 4 to 20mA (refer to section 4-20mA REMOTE OUTPUT). Connect the terminal marked “positive” to the positive meter terminal. This current signal can be used with a volt meter by feeding the signal to a resistor connected to the ground. The voltage developed across the resistor will follow Ohm’s law V=IR.

For example: a 3-volt meter can be used with a resistor of 3/ .02 = 150 ohms, which will result in a full-scale reading of 3 volts for a 20mA output.

The terminals called TX+, TX-, RX+, and RX- (at the bottom of the PCB) are used for the serial communication link. They are also in pairs to accommodate “daisy chaining,” but the pairs are arranged for twisted pairs instead of adjacent redundancy. The serial communication is achieved by using ASCII character code transmission at 4800 through the USB port on the host computer. The P520 uses RS-422 data transmission which is over two, twisted pairs that are differentially transmitted and received, allowing long wire runs to be used through noisy environments. A USB to RS422 converter must be used to communicate with the P520, and the connections are made to the terminals marked TX+, TX-, RX+ and RX-. The transmitting, twisted pair goes to the TX terminals, and the receiving, twisted pair goes to the RX terminals.

**NOTE: The terms “transmit” and “receive” used here with respect to the P520 will be reversed with respect to the converter connection on the host computer. Refer to later sections in this manual for a detailed description of the software and how it is to be used with the P520.**

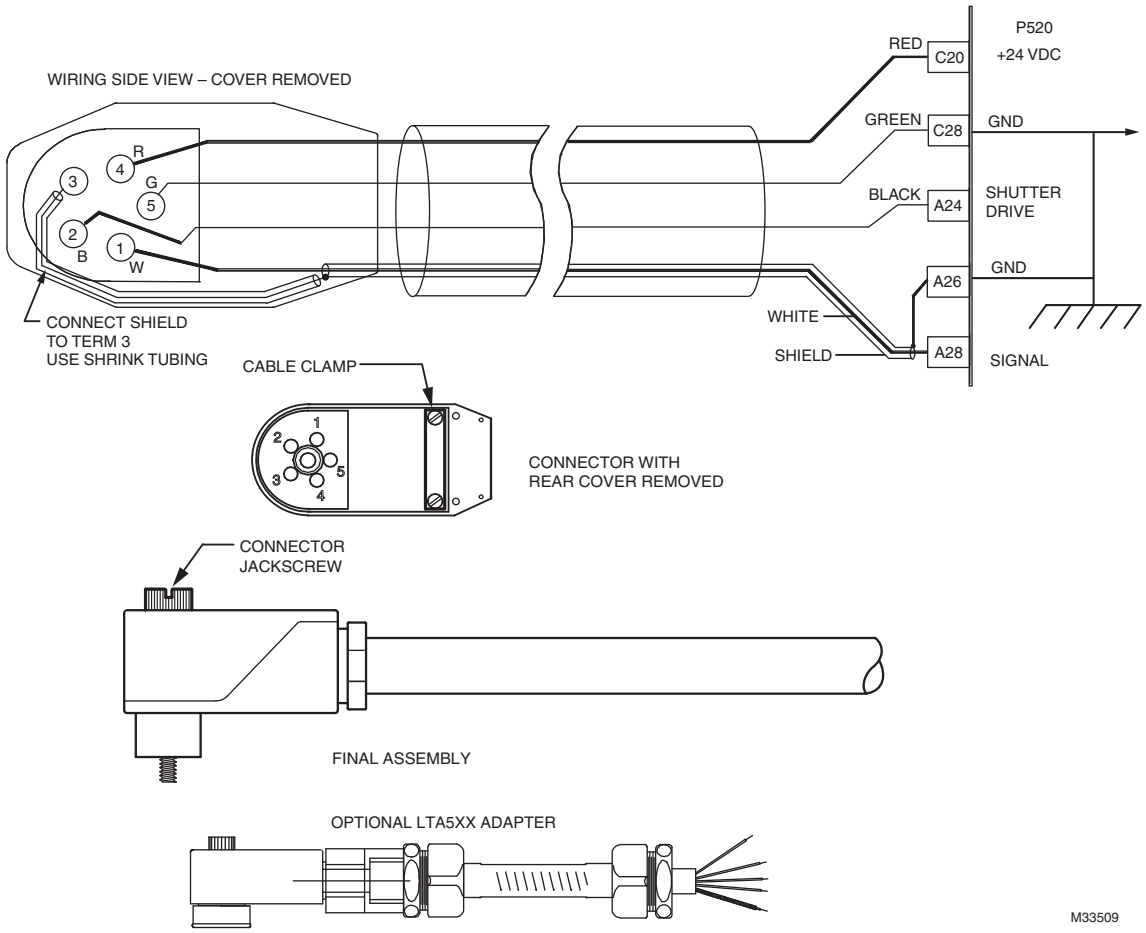
# Wiring the Viewing Head

Wiring of the viewing head is made to the terminals on the rear backplane PCB. These terminals are described as follows:

**Table 1. Terminal Descriptions.**

| Terminal | Description |
|---|---|
| +V | 24VDC power to viewing head |
| GND | Power Ground |
| SC | Self-check/shutter drive signal to viewing head |
| SIG | Flame signal from viewing head |
| SIG GND | Signal ground |

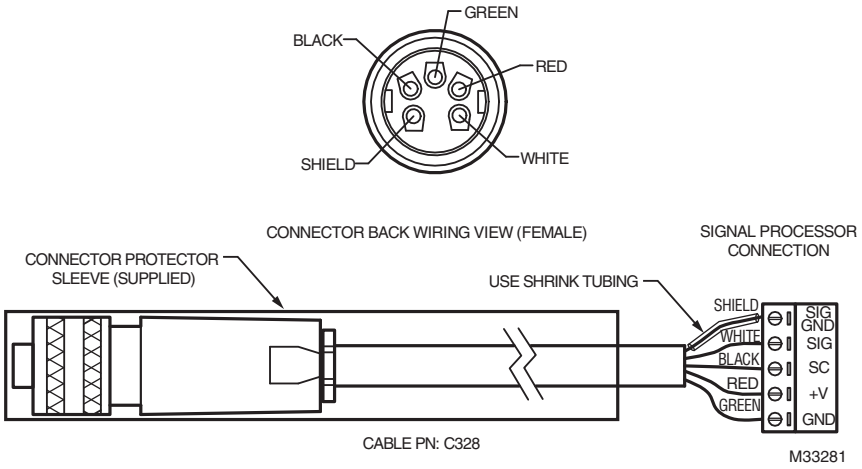
Fig. 4 and 5 show four-conductor cable to the viewing head. Note that the flame signal wire going to terminal SIG is shielded, and the shield is terminated at both ends of the cable to SIG GND.




***IMPORTANT***

*Source impedance resistor required at the signal processor between SC and SIG GND terminals for proper signal transmission. For resistor value, refer to Wiring of Viewing Head section.*

**Fig. 4. Viewing head wiring.**




***IMPORTANT***

*Source impedance resistor required at the signal processor between SC and SIG GND terminals for proper signal transmission. For resistor value, refer to the Wiring of the Viewing Head section.*

**Fig. 5. Wiring connections for S550BE, S552BE and S556BE viewing heads.**

A source impedance resistor is required when using the P520 signal processor with S55X, S55XB and S55XBE series viewing heads. This resistor should be 330 ohms (factory installed) for viewing head cable runs up to 500 feet (152 meters), and it should be 150 ohms for cable runs of 500 feet to 1000 feet (152 to 305 meters). The resistor should be installed across the SC and SIG GND terminals. A 1/4 watt resistor is suitable.

It should be noted that the flame signal wire is shielded, and that the shield is terminated at both ends. The shield must be a braided type for this application in order to maintain an electrical path. For this reason, a foil type shield should not be used. This signal ground shield is also the self-checking or shutter drive circuit return path. It is recommended that Honeywell C328 or C330 cable be used for all applications (viewing head model dependent).

For detailed instructions on cable preparation and wiring the viewing head connector, refer to the applicable manual for the viewing head being installed.

## Power Supply

Careful consideration should be given to the power supply used for the P520. 24VDC is used to back bias the “steering” rectifier, as shown in Fig. 3, to prevent the power from feeding into the 24VDC supply. Each P520 signal processor draws approximately 150mA, and each viewing head draws about 100mA of current (24VDC).

The viewing head is powered by the P520 signal processor via a 0.25A self-resetting fuse. The power to the signal processor itself is via a 0.75A self- resetting fuse. These self-resetting fuses are re-set when power to the signal processor is removed. It is recommended that no more than four P520 signal processors be supported by one 24VDC power supply, unless a method of redundancy is employed together with larger capacity power supplies.

Other possible combinations can be used; for instance, the battery backup terminal could be used for redundancy. However, care must be taken with these redundant schemes to make sure that failure of the primary power supply won’t affect the backup power supply, as well.

## Redundant Power Supplies

It may be more economical to use larger-capacity power supplies for applications using twelve or more P520 signal processors.

For example: a power supply may power twelve P520 signal processors, each with one viewing head. Should the power supply fail, a redundant scheme utilizing two power supplies with “steering” rectifiers to prevent current from flowing into a failed power supply output would prevent the twelve flame monitors from being shut down.

Larger power supplies can be used with this redundant wiring scheme if there are more than twelve P520 signal processors in a system. Care should be taken when wiring multiple signal processors to ensure the selected bus wires will carry the current. The terminals on the rear PCB will accommodate a wire size up to 14AWG, allowing for relatively high currents.

# OPERATION

## Self-Checking

There is a small processor in all viewing heads and it is possible that it could fail and produce erroneous viewing head pulses. The self-check circuitry guards against such an occurrence. There are several tasks that require intelligent interaction between the viewing heads and the signal processor. If all of the interactions do not occur properly, the viewing head will not send pulses back to the signal processor and the flame relay will open.

Verifying the validity of the gain code received is one of the tasks performed by the processor in the viewing heads. The self-check pulse from the signal processors is a 100ms-wide, 20V to 24V pulse with two notches or breaks in it. The position of each of the two notches communicates a gain code one to nine plus parity to the viewing head. The viewing head sends back an ID pulse in the first half of the 100ms self-check time. One viewing head expects to receive data with one parity and the other expects to receive data with the other parity. If a viewing head does not receive its correct parity plus the gain code once per second, it produces no output pulses.

## Powering up the P520

Once the power is connected (24VDC) to the proper terminal, the P520 signal processor will be operational. There is no ON/OFF switch on the P520; the moment it is powered on, it will reset and initialize. The self-checking light will start flashing, and one of the channel LEDs (A or B) will light (A will be ON if the channel select input at the plug-in connector is de-energized). Ensure that the voltage is 24 to 26VDC. The P520 signal processor will be reset when the power is turned on.

The P520 has been designed to deal with any foreseeable power failure or anomaly.

For example: if the power goes off while you are in the process of storing a set point (either from the front panel or from the remote, host computer), the internal power monitor circuit will signal the P520 signal processor to complete the store function before shutting down in an orderly manner. This prevents invalid data from being stored and protects existing data in the EEPROM (Electrically Erasable Programmable Read Only Memory) from corruption. This shut down process is facilitated by a special internal power supply that provides power just long enough to allow the processor to perform the shut down.

This internal circuit monitors the 24VDC power feeding the P520 signal processor, and when the voltage drops to about 19 volts, the processor shuts down, the program stops running, and the self-checking function ceases (the self-checking relay de-energizes). The blinking, SELF-CHECK O.K. light on the front panel will go out, and the flame relay will de-energize.

Note that the earlier S509 and S512 viewing heads will shut down at about 17.0 volts; these viewing heads have their own power-monitoring capability, and will shut down on their own, independent of the signal processor.

When the power feeding the P520 exceeds 19 volts, the program is re-started. The SELF-CHECK O.K. light will start blinking, and the self-check relay will energize. If flame is present and a S509 or S512 viewing head is being used, the flame signal will not come back on until the power reaches 21.5 volts. This can cause a lockout condition if the viewing head turns on during the dark period (defined by the periodic self-check signal going to the viewing head each second), requiring a manual reset of the P520. There is a 20 per cent probability that a lockout will occur because of the duty cycle of the self-check function (200 mSEC on and 800 mSEC off). The S506 and S511 do not incorporate the power-monitoring shutdown function, and will not cause a lockout condition.

These design precautions ensure that there will never be an unsafe situation created by abnormal line power (115VAC) conditions. The 26VDC power is very unlikely to come on gradually, but, if this did occur, the P520 would not get a proper reset. So, there is another function in the micro-processor (used in the P520), implemented by circuitry and software, that causes the P520 to appear dead (i.e., the front panel will be dark) and to stay this way until the power is recycled in an abrupt manner, initiating the reset.

## Set Points

There are 16 set points stored in memory in the P520, divided into two equal sets, A and B. The 5 items listed in Table 2 can be accessed directly from the buttons on the face of the signal processor per the instructions below.

**Table 2. Set Point types.**

| Set Point | Display | Number |
|---|---|---|
| FLAME ON | 4 DIGIT NUMBER | 0001-2999 |
| FLAME OFF | 4 DIGIT NUMBER | 0000-2999 |
| GAIN SET | 2 DIGIT NUMBER | 00-99 |
| F.F.R.T. | 1 DIGIT NUMBER | 1, 2 OR 3 |
| TIME DELAY ON | 1 DIGIT NUMBER | 0,1, 2 OR 3 |

To review any of the currently stored set points for the 5 items above, push the related button on front of the P522. For instance, to determine the current FLAME ON set point, press the FLAME ON button. The set point will be displayed on the readout for about four seconds, then the display will return to normal. The set points displayed will be for the channel that is active, which is indicated by a steady illumination of push-button A or B.

To review the set points for the other channel, first select the channel (A or B), then press the related set point button.

For example: if channel A is already ON, indicating it is functional, and B is pressed, A will go out and B will proceed to flash slowly, indicating that further action is required. If A is already ON and A is pressed, it will stay steady ON and start to blink rapidly after any of the five set point buttons listed above are pressed.

In all cases, A or B will rapidly blink after the set point is selected. This action serves to alert the user that the current display is no longer that of the flame signal, and further action is required.

The fact that A or B is already on has nothing to do with the process of viewing the current set points, except that you do not have to select the channel if it is already on. The steady illumination of A or B indicates which channel is functionally active, and is selected at the terminals marked CHAN SEL.

At any time, you can press the reset button causing the P520 signal processor to return to normal operation. The reset button is also used for resetting the lockout condition as explained in the section Self-checking Function.

Additionally, the viewing head temperature can be viewed by pressing the reset and down arrow button simultaneously.

## Changing Set Points

Changing any of the five set points shown in Table 2 can be accomplished by selecting the set point via its button on the control face and using the UP or DOWN arrow buttons to

change the displayed value. Once the desired value is displayed, press the STORE button. When the set point is stored, four dashes are displayed momentarily, indicating that the new value was stored into the EEPROM. Illogical settings are not accepted; A display of four “E’s” when the STORE button is pushed indicates that an error was made when selecting the set points. For instance, selecting a flame out set point that is equal to or greater than the flame on set point will result in this error indication.

The set points can also be selected remotely through the serial communication port using a host computer.

## Additional Set Points

**Table 3. Additional Set Points.**

| Set Point | Display | Number |
|---|---|---|
| IR GAIN | 3 DIGIT NUMBER | 0-699 |
| IR FILTER | 1 DIGIT NUMBER | 1-8 |
| UV GAIN | 2 DIGIT NUMBER | 0-99 |

Only adjustment information pertinent to the attached viewing head(s) will be visible to the user; for a UV only viewing head, no IR GAIN or IR FILTER settings would be shown and for an IR only viewing head, no UV GAIN setting would be shown.

To change or adjust any of the 3 additional setpoints shown in Table 3, refer to the programming flowcharts towards the back of this manual. IR gain adjustments are covered in the next section as well.

## IR Gain Adjustment

The adjustable range for IR Gain is 0-699 with a factory default value of 450. When adjusting IR gain, the user will notice gain “jumps”. As the gain is increased, the user will notice the following:

a. 000 – 099 is linear and then it jumps to 150
b. 150 - 199 is linear and then it jumps to 250
c. 250 - 299 is liner and then it jumps to 350
d. 350 - 399 is linear and then it jumps to 450
e. 450 - 499 is liner and then it jumps to 550
f. 550 - 599 is linear and then it jumps to 650
g. 650 - 699 is linear

With each step change or “jump”, the gain is double but values in between are liner. For example, a setting of 250 doubles the gain setting of 150. When gain is adjusted to 000, the IR contribution is zero.

There are 8 high pass filter settings available for most IR viewing heads (model dependent) as shown below.

1 = 16 HZ

2 = 24 HZ

3 = 33 HZ

4 = 52 HZ

5 = 75 HZ

6 = 100 HZ

7 = 155 HZ

8 = 215 HZ

## Flame Failure Response Time (FFRT)

The flame failure response time, or F.F.R.T., is defined as the time it takes for the flame relay to de-energize after the flame signal (from the viewing head) is below the programmed Flame Off setpoint. This time delay is programmable from both the front panel of the P520 and a remote, host computer. Only three settings are possible: one, two and three seconds.

The maximum time delay is limited to three seconds in compliance with the FM (Factory Mutual) limit of the F.F.R.T. to be less than four seconds.

## 4-20mA Remote Output

The standard remote meter output has a 0-20mA range and is designed to drive remote meters, as explained earlier in this manual. You can convert this output to a 4-20mA range, as follows:

Press the front panel push-buttons (indicated in Table 4) while holding down both the up arrow and down arrow buttons. Press all buttons in each row together (i.e., three in the first row, two in the second row, and three in the last row).

**Table 4. Remote Output Setting.**

| FLAME ON | FLAME OFF | GAIN SET | F.F.R.T. | TIME DELAY ON |
|---|---|---|---|---|
| X | X | X | | |
| | | | X | X |
| X | X | X | | |

Doing this toggles the function back and forth between the 0-20mA and 4-20mA ranges.

The change will be verified by four dashes “----” and “4-20” momentarily displayed. If the signal processor is programmed for the 4-20mA range, “4-20” will be displayed; toggling back to the 0-20mA range will again cause four dashes to appear on power-up of the unit. The factory default setting is 4-20.

The 4-20mA signal from the P520 is powered from the P520 itself. When sending the signal to a remote device (such as a distributed control system, PLC or burner management system), the input must be isolated. If there is a ground potential difference between the two systems, then there could be noise and performance problems. When using a remote meter by itself, this will not occur, because it will not be tied into another electrical system (will not be sharing grounds).

The bargraph reading on the front panel will not be affected by this change to 4-20mA output. It will remain the same as before (i.e., show zero on no signal detected). The 4-20mA output will still perform the same way on the high end (i.e., on a strong signal, it will saturate at the same level, slightly above 22mA).

Specifications for the analog current output signal are provided in the SPECIFICATIONS section.

# SETUP AND ADJUSTMENT PROCEDURES

## Sighting Adjustment

Before making definitive settings (i.e., establishing the set points) for FLAME ON/OFF, the user must first optimize the sighting of the viewing head. For detailed mounting and sighting information, refer to the applicable literature for the viewing head used.

## Initial Setup

The initial settings for the P520 should be as follows:

1. F.F.R.T. (Time Delay Off) to 3 SEC.
2. GAIN SET to 25.
3. TIME DELAY ON to 0.
4. FLAME ON to 200.
5. FLAME OFF to 100.
6. IR GAIN to 451.
7. IR FILTER to 3 (33 Hz).
8. UV GAIN 32.

The above settings will be satisfactory for most applications, but are used only as a starting point. Many variables can affect the readings making it impossible to catalogue all the settings, and each viewing head has its own characteristics for the different types of fuels and burners.

The initial settings for viewing heads S509, S511, S512 should be as follows:

1. Set filter switch to LL position.
2. Gain potentiometers (POTS) full clockwise (these are 25-turn potentiometers – a slight clicking sound will be heard when the POT is maximum clockwise). There are two POTs on the S509: one for the Si channel, and one for the PbS channel. If the fuel is natural gas, turn the Si channel off (pot full counter clockwise).

There are no initial settings for the S506 UV viewing head. It is important that this viewing head be properly aimed to pick up the maximum signal.

## Adjusting Set Points

Before adjusting the set points, take readings with the P520 on the two following conditions; write down the readings for the burner ON and OFF (with other burners on) under low load conditions, and then the readings for the burner ON and OFF under high load conditions.

There must be a definitive ratio between the readings for burner ON and burner OFF. This ratio can be defined by using the lowest reading for burner ON from both of the load conditions, and the highest reading for burner OFF from both of the load conditions. If the readings are 2:1 or more (BNR ON to BNR OFF) then there should be no problem discriminating between burners.

A good balance for the set points would be:

ON SET POINT = .75A + .25B

OFF SET POINT = .25A + .75B

where A is the lowest burner ON reading, and B is the highest burner OFF reading.

A smaller ratio will work, as long as the lowest BNR ON reading and the highest BNR OFF reading never deteriorates to the point the former is equal to or less than the latter. In other words, A must always be greater than B. Using a safety factor of 2:1 will allow for flame signal changes that probably will occur over different operating conditions.

## Viewing Head Temperature

The model S55XB/BE series of viewing heads have in place a sensor for sensing the internal temperature of the head. To access the reading of the viewing head temperature, press the “Reset” and the “Down” arrow key at the same time. The temperature reading will be displayed in the four-digit readout. The reading (indicated in °C) will disappear and the normal reading will continue after several seconds.

# TROUBLESHOOTING

**Table 5. Troubleshooting procedures.**

| Problem | Troubleshooting Steps |
|---|---|
| No flame signal and no display. | **1.** Check the wiring between the signal processor and the viewing head. Refer to the Wiring the Rear PC Board section.<br>**2.** Using a volt meter check the voltage at PWR IN terminals with a volt meter. It should measure approximately 24VDC. If not, check the power supply and wiring, or replace the power supply.<br>**3.** If 24VDC is measured, remove the power for 10 seconds. If the self-resetting fuse has tripped, removing then reapplying power will reset the fuse. |
| Digital display shows 0000 and there is no flame signal. | **1.** Remove connector from viewing head and check wiring per Fig. 4 and 5.<br>**2.** Ensure the proper impedance resistor is in place (refer to Wiring of Viewing Head section). Using a volt meter, check the viewing head terminals on the P520, for 24VDC across +V and GND. If the voltage is low, check input voltage to the signal processor. If the input voltage is measured to be in spec, remove power and disconnect all connections to the viewing head(s). Wait 10 seconds (which resets the self-resetting fuse) and then reapply power and re-measure voltage across +V and GND.<br>**3.** If voltage measures +24VDC (nominal) at the viewing head terminals at the signal processor, turn off power to the signal processor and using an ohmmeter check continuity of each cable wire from the signal processor terminals to the viewing head connector terminals. If cable continuity checks out, the viewing head may be defective. |
| Flame signal shows on display; flame on relay and light are off. | **1.** The viewing head is incorrectly wired, or defective (see above).<br>**2.** The set point values for flame ON are incorrect. |
| Flame signal shows on analog bar graph display; flame light is off; lockout light is on. | **1.** The viewing head may be defective.<br>**2.** There may be a noise or grounding problem. Check that equipment is properly grounded and ensure good clean contact on all ground connections. Move viewing head and cable/conduit at least 12 inches (31 cm) away from any source of high powered switching (e.g. igniter equipment). Refer to Grounding and Shielding section.<br>**3.** Press the RESET button on the front panel. |
| The 1-9 LED stays on. | **1.** There may be a noise or grounding problem (see above and refer to Grounding and Shielding section).).<br>**2.** The viewing head may be defective. |
| The front panel buttons do not respond. | **1.** The P520 front panel may be locked out.<br>**2.** Signal processor may be in remote operation only mode.<br>**3.** Cycle power to the signal processor with the viewing head connected. |

## Module Communications

The P520 communicates with any host computer that has a USB port and supports ASCII character code transmission at 4800 baud (or, in current revisions of the processor chip, at 4800 or 9600 baud). The baud rate is displayed with the module address in the current versions (see SETTING ADDRESSES, section). The data transmitted to and from the P520 is over two twisted pairs that are differentially driven and received according to the RS-422 standard. The differential mode allows long wire runs in harsh, electrical environments. Honeywell offers a RS485/422 to USB converter to use in conjunction with the P520 signal processor. The Honeywell part number is COMMOD.

Modbus Communication protocol allows the P520 to communicate with open process controllers or human-interface host computers that support this protocol. The P520 processor status and settings are organized as 23 4X holding registers and five 0X discrete registers. For more information on Modbus protocol, please refer to Modicon's Modbus Protocol Reference Guide (PI-MBUS-300 Rev E).

## Communication Setting

P520 can communicate only in Modbus RTU mode, with the following configuration:

- 9600 baud
- 8 data bits
- No parity
- 1 stop bit

The factory default of a P520 station number is 0. It is important to change the station number so that there are no duplicate stations in the network.

To change or check the station number of the P520, proceed as follows:

1. Press and hold the Reset button for 4 seconds.
2. The 4 LED digits will show the baud rate and the station number. The 2 leftmost digits are the baud rate (96 or 48); the 2 rightmost digits are station number from (0 to 63).
3. Press the up/down button to change the station number.
4. Press the Store button to save station number.

## Protocol Detect

P520 with firmware version 5.0 still supports the existing Honeywell proprietary protocol. After power-up, the processor will listen for both protocols. Once the protocol has been detected, communication must remain in this protocol until the unit is powered off.

## MODBUS RTU Function Supported

Four Modbus functions are supported:

- 01 Output Coil Read
- 03 Holding Register Read
- 06 Preset Single Holding Register
- 16 Preset Multiple Holding Register

## Registers Map

**Table 6. 4x or numerical registers.**

| Value | Definition |
|---|---|
| 400001 | Flame Count Of Active Channel (read only) |
| 400002 | Processor Status (read only) |
| 400002/0 | Viewing head/Channel Selected (0=Channel A) |
| 400002/1 | Flame On Relay Status |
| 400002/2 | Processor Lockout Status (0=lockout) |
| 400002/3 | Panel Access Disabled (0=disabled) |
| 400002/44-20 | Output Status (0=0-20) |
| 400003 | Flame On Channel A |
| 400004 | Flame On Channel B |
| 400005 | Flame Off Channel A |
| 400006 | Flame Off Channel B |
| 400007 | Gain Channel A |
| 400008 | Gain Channel B |
| 400009IR | Analog Gain Channel A |
| 400010IR | Digital Gain Channel A |
| 400011IR | Filter Channel A |
| 400012UV | Gain Channel A |
| 400013IR | Analog Gain Channel B |
| 400014IR | Digital Gain Channel B |
| 400015IR | Filter Channel B |
| 400016UV | Gain Channel B |
| 400017 | Viewing Head Type Channel A (read only) |

**Table 6. 4x or numerical registers.**

| Value | Definition |
|---|---|
| 400018 | Viewing Head Type Channel B (read only) |
| 400019 | Temperature Channel A (read only) |
| 400020 | Temperature Channel B (read only) |
| 400021 | Time Delay on (Upper nibble = B lower =A) |
| 400022FFRT | (Upper nibble = B lower = A) |
| 400023 | Firmware Version # (read only) |

**Table 7. 0x or discrete registers (all read only).**

| Value | Definition |
|---|---|
| 000001 | Viewing head/Channel Selected (0=Channel A) |
| 000002 | Flame On Relay Status |
| 000003 | Processor Lockout Status (0=lockout) |
| 000004 | Panel Access Disabled (0=disabled) |
| 0000054-20 | Output Status (0=0-40) |

## Communication with Modicon PLC

Each Modicon PLC comes with a Modbus port. The control program can read/write the settings from/to the P520 signal processor via this port. A XMIT loadable module is needed to send Modicon functions. The XMIT loadable module is available from Modicon Inc.

**NOTE: Not all models of Modicon PLC's will accept the XMIT loadable module. Please consult your local Modicon dealer for more information.**

## Communication with Human-Interface Host Computer

A number of Modbus drivers for your operating system are available from third party developers. These drivers allows your application programs to communicate with the P520 signal processors directly.

## USB to RS-422 Conversion

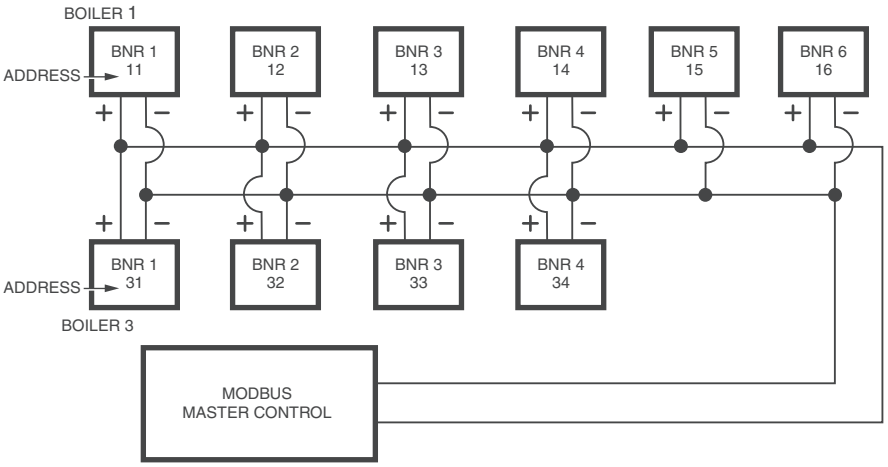
It is necessary to use a converter at the host computer. The Honeywell COMMOD converter module can be used, and is recommended because of its photocoupler isolation. The converter must have galvanic ground isolation.

## Setting Addresses

Each P520 must have its own unique address. The address can easily be changed by pressing the RESET push-button for >2 seconds. This causes the P520 to display its address on the four-digit display (0000 to 0063). The address can now be changed by using the UP or DOWN arrow buttons. When the desired address is displayed, push the STORE button, and the P520 will restore this new address.

In P520 signal processors with software revision 3.p and higher, the baud rate can also be changed when the module address is changed. The baud rate is displayed in the highest two digits of the numeric display (i.e., 4802 is 4800 baud and

address 2). To change to 9600 baud, increase the display past 4863. The next display will be 9600, which is 9600 baud, address 0. Then increase the display further to the desired address. To return to 4800 baud, reduce the display below 9600, and set the desired address.




NOTES: A CONVERTER MAY BE NECESSARY FOR COMMUNICATION WITH THE MODBUS MASTER CONTROL.

USE SHIELDED CABLE FOR COMMUNICATION WIRING.

DRAWING IS FOR GENERAL REFERENCE ONLY.

FOR RS422 COMMUNICATION WITH THE P520, 4 WIRES FROM EACH SIGNAL PROCESSOR WILL BE REQUIRED (+RX, -RX, +TX, -TX), FOLLOWING POLARITY FROM EACH SIGNAL PROCESSOR. AT THE CONVERTER, THE TRANSMIT AND RECEIVE WIRES WILL BE REVERSED. REFER TO FIG. 7 FOR CONVERTER TO SIGNAL PROCESSOR WIRING DETAILS.

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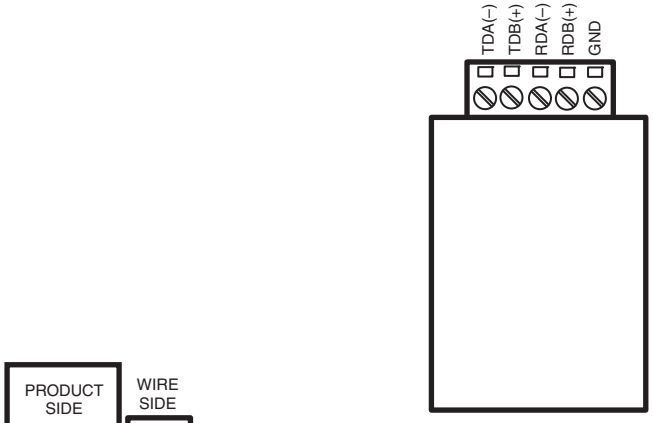
**Fig. 6. Typical Communications wiring and recommended addressing.**




COMMOD USB TO RS422/485 CONVERTER

| CONVERTER CONNECTOR | DESCRIPTION | SIGNAL PROCESSOR TERMINAL |
|---|---|---|
| TDA(-) | TRANSMIT/TO PROCESSOR | -RX |
| TDB(+) | TRANSMIT/TO PROCESSOR | +RX |
| RDA(-) | RECEIVE/FROM PROCESSOR | -TX |
| RDB(+) | RECEIVE/FROM PROCESSOR | +TX |
| GND | GROUND | SIG GND |

NOTES:

SELECT THE APPROPRIATE DIP SWITCH SETTINGS FOR RS-485 COMMUNICATION PER THE VENDOR'S INSTRUCTION SHEET.

SOFTWARE DRIVERS MAY BE DOWNLOADED FROM B&B ELECTRONICS' WEBSITE.

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**Fig. 7. COMMOD communication converter wiring.**

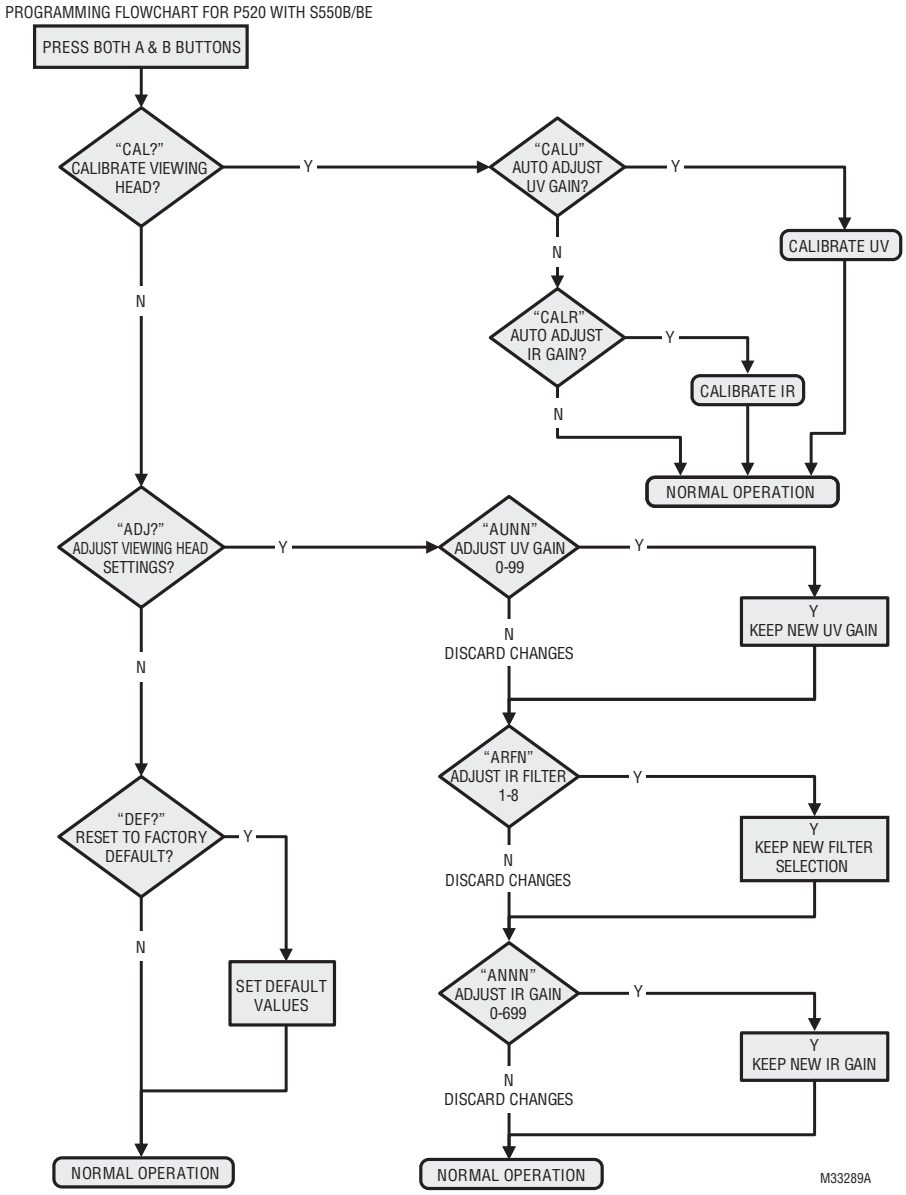


**Fig. 8. P520 with S550B/BE programming flowchart.**

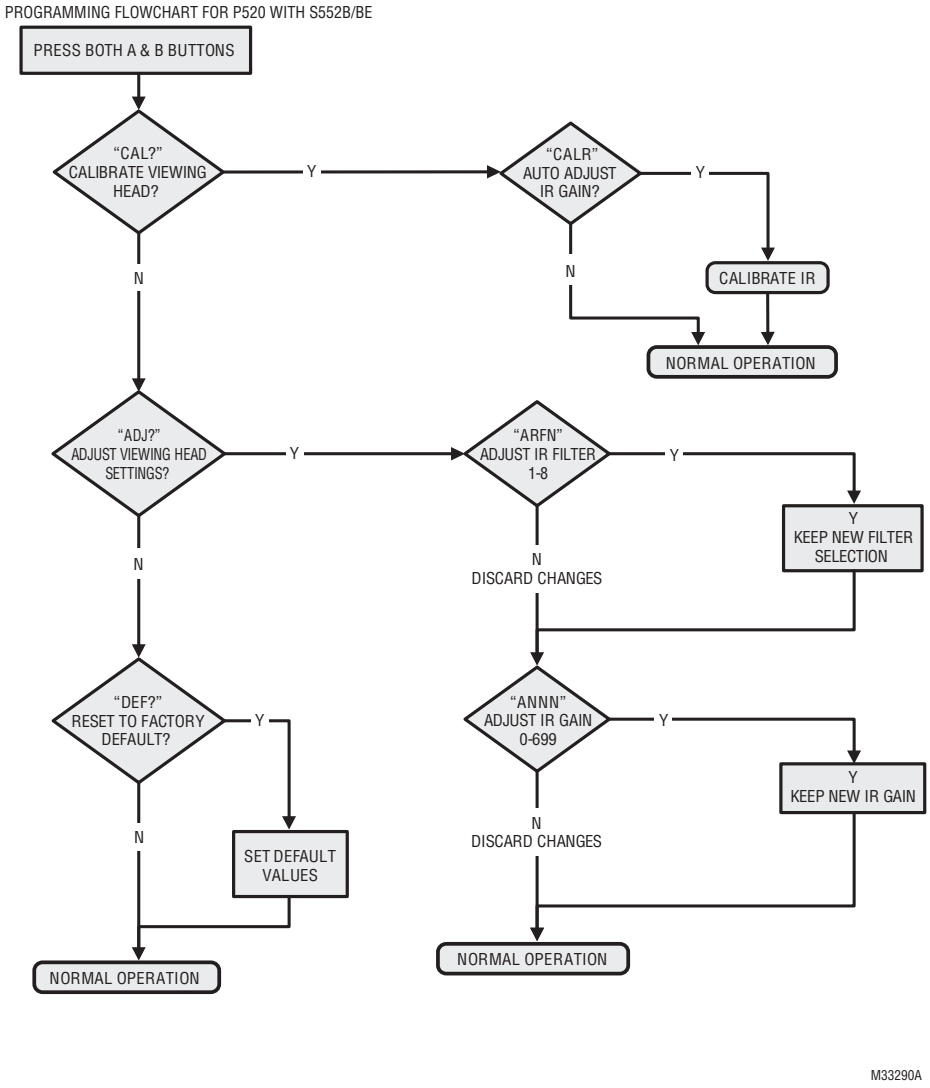


**Fig. 9. P520 with S552B/BE programming flowchart.**

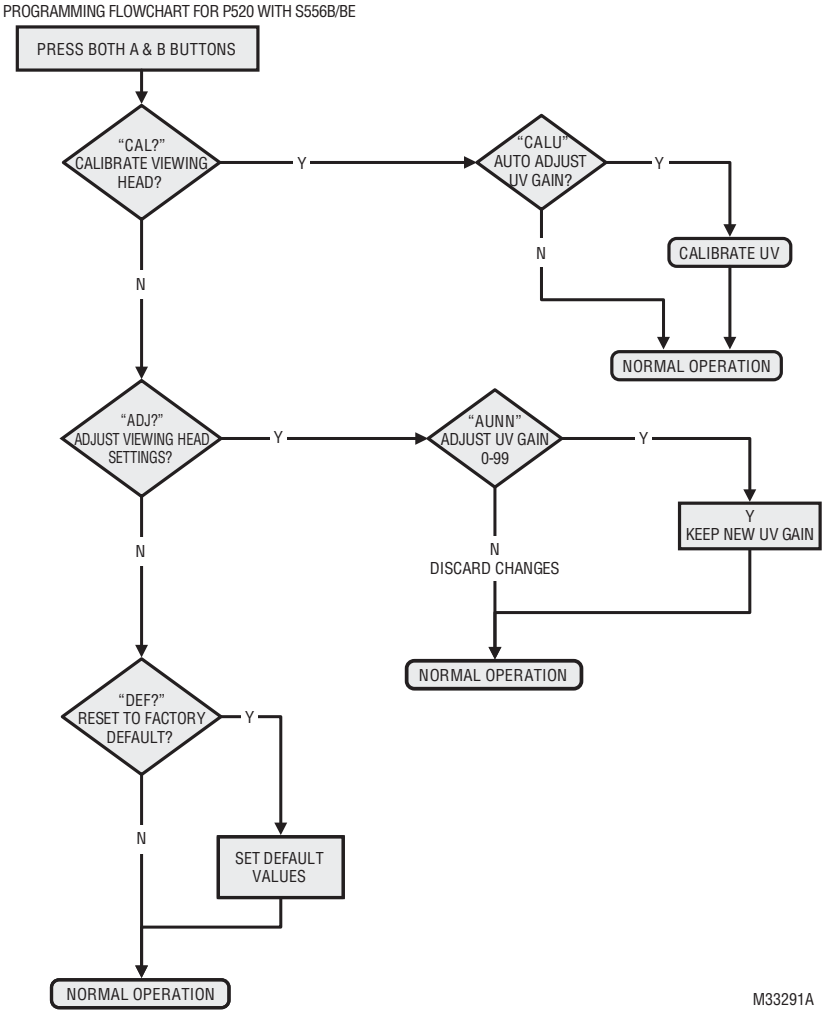


**Fig. 10. P520 with S556B/BE programming flowchart.**

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66-2066—01 M.S. 10-12
Printed in United States

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